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abstract Complete and precise characterization of a quantum dynamical process can be achieved via the method of quantum process tomography. Using a source of correlated photons, we have implemented several methods, each investigating a wide range of processes, e.g., unitary, decohering, and polarizing. One of these methods, ancilla-assisted process tomography (AAPT), makes use of an additional "ancilla system," and we have theoretically determined the conditions when AAPT is possible. Surprisingly, entanglement is not required. We present data obtained using both separable and entangled input states. The use of entanglement yields superior results, however.